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(19)日本国特許庁（JP）　(12)公開特許公報(A)　(11)特許出願公開番号
特開平11－260320
(43)公開日　平成11年(1999)9月24日

(51)Int.Cl.*	識別記号	FI		
H01M 2/02		H01M 2/02		A
2/04			2/04	A

審査請求　未請求　請求項の数8　FD　(全6頁)

(21)出願番号　特願平10－82657
(22)出願日　平成10年(1998)3月13日

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(54)【発明の名称】　扁平薄型角型電池

(57)【要約】
【課題】　従来技術の問題点を解消し、比較的簡便に量産が可能で、かつ強度が大きく、さらに高エネルギー密度な扁平薄型角型電池の提供。
【解決手段】　広口面が一方向に開放され、かつ該広口面の周辺に鍔形状部分を有する金属単体からなる扁平薄型容器部分と、金属単体からなり該容器部分の蓋となる部分の間に電池要素を収納し、また、前記扁平薄型容器部分の鍔形状部分と蓋部分を金属接合によって気密封口した扁平薄型角型電池において、該電池が下記の要件を満足することを特徴とする扁平薄型角型電池。
① 気密封口した鍔形状の少なくとも一部分を容器部分の底部方向に曲げ加工した部分を有すること。
② 曲げ加工した部分の先端から広口面までの容器厚さ方向の折り曲げ鍔部の長さが、前記容器部分の容器厚さの1／2以上であること。

の1／2以上であること。なお、上記容器及び／又は蓋の外表面については、金属又は金属以外の材料で被覆等の処理を施すことができる。

【0006】すなわち、従来の扁平薄型角型電池は物理的に折り曲げる力に対して弱いという問題点を有しているが、本発明の扁平薄型角型電池では、折り曲げ強度と電池側面からの耐衝撃性が大幅に改善され、電池の取り扱いに対しても大きな注意を払う必要が無くなり、また、これまで封口部分が鍔状に盛り上がり、加工が困難であった熱収縮チューブによる外装加工が容便にできるようになり、高エネルギー密度の扁平薄型角型電池を得ることが可能となった。

【0007】本発明の扁平薄型角型電池において、曲げ加工した部分の先端と扁平薄型容器部分の底部とが同一平面に位置することにより、熱収縮チューブによる外装加工が容便になった。特に折り曲げ強度と電池側面からの耐衝撃性が大幅に改善されることにより信頼性の高い扁平薄型角型電池を得られるようになった。また、曲げ加工を行う前に、曲げ加工した部分の先端と扁平薄型容器部分の底部とがほぼ同一平面に位置する長さに鍔状形状部分が加工されたものを用いることにより、曲げ加工した部分の先端の長さを加工後切り揃える手間を省くことができ、大幅なタクトの短縮が可能となり、コストの低減をもたらした。前記「同一平面」とは、前記のような効果を奏する「平面内」であれば良く、「ほぼ同一平面内」の範囲のものであっても良い。曲げ加工した部分の先端と扁平薄型容器部分の底部とがほぼ同一平面に位置するようにすることにより、熱収縮チューブによる外装加工が容便になった。

【0008】前記曲げ加工は、鍔形状部分の4辺を同時に曲げ加工することにより大幅なタクトの短縮が可能となり、コストの低減をもたらすことができる。このときプレス加工を用いることにより、より精密に制御された折り曲げ鍔部の加工を行うことができるようになり、大幅なタクトの短縮が可能となり、コストの低減をもたらした。該曲げ加工した鍔部の角度は広口面に対して70°～90°の範囲が好ましく、さらに好ましくは80°～90°の範囲であり、本発明により、より折り曲げ強度と電池側面からの耐衝撃性が大幅に改善され扁平薄型角型電池の取り扱いに対しても大きな注意を払う必要が無くなった。

【0009】本発明において該鍔形状部分の金属接合を超音波接合とすることにより信頼性の高い気密封口部が得られ、また、大幅なタクトの短縮が可能となり、コストの低減をもたらした。さらに、本発明において該鍔形状部分の金属接合をレーザ溶接とすることにより信頼性の高い気密封口部が得られ、また、大幅なタクトの短縮が可能となり、コストの低減をもたらした。以下、リチウム二次電池の場合を実施例として本発明をさらに詳細に説明するが、本発明はこれらに限定されるものではない。なお、非水溶媒および電解質塩は十分に精製を行い、水分20ppm以下としたもので、さらに脱酸素および脱窒素を行った電池グレードのものを使用し、すべての操作は不活性ガス雰囲気下で行った。

【0010】

【実施例】実施例1

（正極）ポリ弗化ビニリデン3重量部をN－メチルピロリドン38重量部に溶解して、活物質としてLiCoO,50重量部と導電剤として鱗給9重量部を加えてホモジナイザーにて不活性雰囲気下で混合分散し、正極用塗料を調整した。これを大気中にてワイヤーバーを用いて20μmアルミニウム箔両面に塗布し、125℃30分間乾燥させた後圧縮形成して帯状正極1を得た。成形後の合計厚さは両面ともに膜厚70μmと同一とした。

（負極）ポリ弗化ビニリデン2重量部をN－メチルピロリドン58重量部に溶解してコークスの2500℃焼成品40重量部を加えてロールミル法にて不活性雰囲気下で混合分散し、負極用塗料を調整した。これを大気中にて20μm銅箔上に塗布、100℃15分間乾燥させた後圧縮形成して帯状負極3を得た。成形後の合計厚さは両面とも膜厚80μmと同一とした。

【0011】前記帯状正極1、帯状負極3および厚さ25μmの微多孔性ポリプロピレンフィルムより成るセパレータ2を楕円状に多数回巻し、図1に示したような負極3、セパレータ2、正極1、セパレータ2（ただし、このセパレータは図示していない。）の順に積層した楕円状渦巻式電極体4を作成した。このようにして作製した渦巻式電極体4を図2に示すように内部に絶縁処理を施したアルミニウム製扁平薄型容器5に収納した。アルミニウム製扁平薄型容器5のサイズは48×90×3mmで鍔部を含むと58×100×3mmである（アルミニウムの板厚：0．2mm）。アルミニウム製正極リード6を正極集電体から導出して電池蓋7に設けた正極端子8に、ニッケル製負極リード9を負極集電体から導出して電池蓋7に設けた負極端子10にスポット溶接した。電池蓋7のサイズは58×100mmである。この扁平薄型容器5を減圧注液装置中に配置させ、該容器の中にエチレンカーボネート／ジメチルカーボネート（1／1：体積比）に溶解した1．0mol/l／1LiPF,溶液の電解液を減圧注液し、蓋を重ねて4辺の鍔部11をアルゴン溶接によって封口した。その後、コーナー部4箇所を溶接部1mmを残して正方形に切り落とし、1辺ずつ該鍔部を下部方向へ90°の角度に折り曲げた。折り曲げた後、電池底部よりも下方に出ている鍔部を切り取り、熱収縮チューブで端子部を除く電池全体を包むことにより本発明の50×92×3mmのサイズの扁平薄型角型電池を得た。この扁平薄型角型電池容器の断面図を図3に示す。本発明の折り曲げ鍔部の長さとは13の長さを表し、容器厚さとは12を表す。以上のように作製した電池を1／3Cの電流レートで充放電した容量

密度とサイクル特性を評価した。容量評価は上部からの単位投影面積当りの電池の容量密度で行い、単位を（mAh／cm²）として表した。また、サイクル特性は初期容量の80%になった時点で評価した。耐衝撃試験は本扁平薄型角型電池10個を100cmの高さから鋼面より大理石からなる机上に落下させて、それによって起こる不良率を測定した。ここでは落下試験後から急激に容量が低下したもの、内部ショートによる動作不良を起こしたものを不良とみなした。タクトの測定は、試験プラントにおける開部の封止から折り曲げに至る工程に要する時間を測定した。

【0012】実施例2

開部の折り曲げ処理を4辺同時に行うこと以外は実施例1と同様である。

【0013】実施例3

開部をアルゴン溶接によって封口した容器（58×100×3mm）を、プレス機に設置した曲げアール0．5の金型（ダイス）にセットし、上部金型（ポンチ）を下降させ、ポンチ荷重150kgfにて4辺同時に折り曲げ加工を行うこと以外は実施例1と同様である。

【0014】実施例4

曲げ加工を行う前に、曲げ加工した部分の先端と扁平薄型容器部分の底部とがほぼ同一平面に位置する長さに予め図4に示すような打ち抜き加工を電池缶と開部に加工した以外は実施例3と同様である。

【0015】実施例5

4辺の開部を超音波溶接法により溶接した以外は実施例4と同様。超音波溶接は20×3mmの溶接面積を持つヘッドを用い、2mmの重なりを持つようにヘッドをずらしながら開部全周に溶接を行った。溶接は20kHzパッチタイプの溶接機を用い、振幅20μm、圧力15kgf、溶接時間0．2sec／shotの条件で超音波溶接を行った。

【0016】実施例6

4辺の開部をYAGレーザにより溶接した以外は実施例4と同様である。YAGレーザは密着させた開部の中央部分に沿って照射していった。溶接の条件は370V、1．7ms、150ppsのパルスで、20mm／sの走査速度で行った。

【0017】比較例1

曲げ加工を行わないこと以外は実施例1と同様である。

【0018】比較例2

4辺の開部を熱融着フィルム（ポリプロピレン製）により融着した以外は実施例1と同様である。

【0019】

【表1】

実施例	1	2	3	4	5	6
単位投影面積当たりの容量密度(mAh/cm²)	13.0	13.0	13.0	13.0	13.0	13.0
サイクル特性(回)	200<	200<	200<	200<	200<	200<
側面からの衝撃に対する不良率(%)	20	20	20	20	20	20
タクト（秒）	80	65	62	48	33	33

【0020】

【表2】

比較例	1	2
単位投影面積当たりの容量密度(mAh/cm²)	10.9	13.0
サイクル特性(回)	200<	132
側面からの衝撃に対する不良率(%)	80	50
タクト（秒）	30	90

【0021】図5に広口面に対して90°に折り曲げた

折り曲げ饲部の長さと折り曲げ荷重との関係を示す。実験は電池長手方向の中央部分が直角になった台座の端部に来るように固定し、電池の固定されていない側の端を上部から下方向へ荷重をかけていき、30°の角度まで折れ曲がるのに要した最大荷重を記録したものである。

【0022】図6に折り曲げ饲部の広口面に対する角度と折り曲げ荷重との関係を示す。実験は電池長手方向の中央部分が直角になった台座の端部に来るように固定し、電池の固定されていない側の端を上部から下方向へ荷重をかけていき、30°の角度まで折れ曲がるのに要した最大荷重を記録したものである。

【0023】図7に側面からの耐衝撃試験における折り曲げ饲部の広口面に対する角度と不良率との関係を示す。耐衝撃試験は本扁平薄型角型電池10個を100cmの高さから側面より大理石からなる机上に落下させて、それによって起こる不良率を測定した。ここでは落下試験後から急激に容量が低下したもの、内部ショートによる動作不良を起こしたものを不良とみなした。

【0024】

【効果】1．請求項1

折り曲げ強度と電池側面からの耐衝撃性が大幅に改善されかつ電池の取り扱いに対しても大きな注意を払う必要が無くなった。また、これまで封口部分が鍔状に盛り上がり、加工が困難であった熱収縮チューブによる外装加工が簡便にできるようになり、高エネルギー密度の扁平薄型角型電池を得ることが可能となった。

2．請求項2

熱収縮チューブによる外装加工が簡便になり、また折り曲げ強度と電池側面からの耐衝撃性が大幅に改善され電池の取り扱いに対しても大きな注意を払う必要が無くなった。

3．請求項3

曲げ加工した部分の先端の長さを加工後切り揃える手間を省くことができ、大幅なタクトの短縮が可能となり、コストの低減をもたらした。

4．請求項4

より折り曲げ強度と電池側面からの耐衝撃性が大幅に改善され扁平薄型角型電池の取り扱いに対しても大きな注＊意を払う必要が無くなった。

＊5．請求項5および6

信頼性の高い気密封口部が得られ、また大幅なタクトの短縮が可能となり、コストの低減をもたらした。

6．請求項7および8

大幅なタクトの短縮が可能となり、コストの低減をもたらした。

【図面の簡単な説明】

【図1】楕円状渦巻式電極体を示す図である。

【図2】アルミニウム製扁平薄型容器と、アルミニウム製扁平薄型容器と電池蓋にアルミニウム製正極リードおよびニッケル製負極リードを溶接したものを示す図である。

【図3】折り曲げ加工後の電池容器の断面を示す図である。

【図4】電池蓋または電池容器の4辺の打ち抜き処理を示す図である。

【図5】折り曲げ饲部の長さと折り曲げ荷重との関係を示す図である。

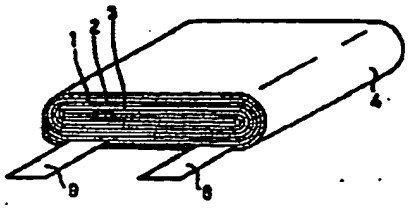
【図6】折り曲げ饲部の広口面に対する角度と折り曲げ荷重との関係を示す図である。

【図7】側面からの耐衝撃試験における折り曲げ饲部の広口面に対する角度と不良率との関係を示す図である。

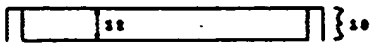
【符号の説明】

1　帯状正極
2　セパレータ
3　帯状負極
4　渦巻式電極体
5　内部に絶縁処理を施したアルミニウム製扁平薄型容器
6　アルミニウム製正極リード
7　電池蓋
8　正極端子
9　ニッケル製負極リード
10　負極端子
11　饲部
12　容器厚さ
13　折り曲げ饲部の長さ

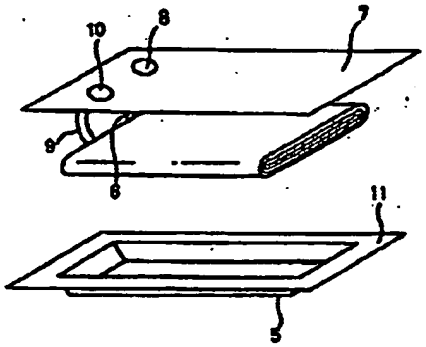
【図1】



【図3】



【図2】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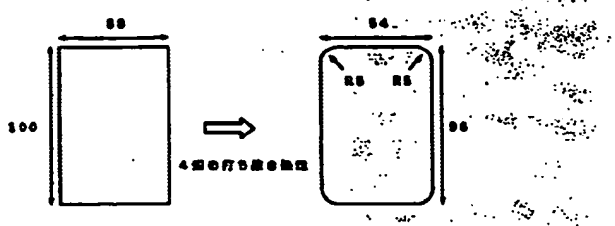
8
7
9
6
11
5

【図4】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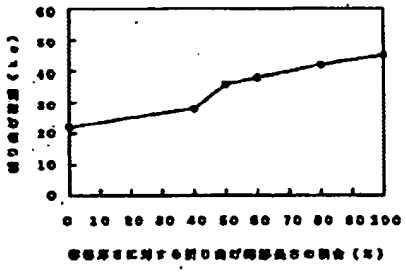
84
R5
R5
96

【図5】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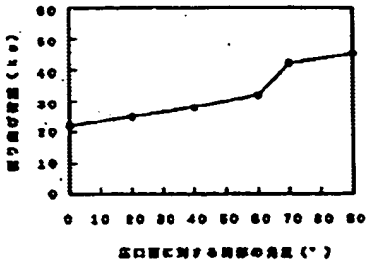
【図6】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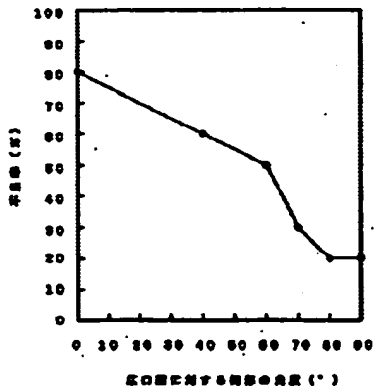
【図7】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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to a flat thin square shape cell.
[0002]
[Description of the Prior Art] Various new cells have come to be desired with portable-izing of a device. As a result, the nickel hydoride battery, the lithium cell, etc. were developed newly. However, not only utilization of a fuel cell subsystem with new being wished but a new cell configuration is searched for strongly. By the conventional cell, especially the cell which is using metal casing, the shape of a cylindrical shape was a standard configuration. This can be obturated airtight and is because it excels in productivity. In order to raise the space efficiency at the time of containing to a device in recent years, a square shape cell [as / whose appearance configuration is a rectangular parallelepiped configuration or a rectangular parallelepiped configuration in which each part was rounded off] has been put in practical use. However, while airtight obturation was easy for this method, it had the problem that productivity was very low and cell cost cost dearly. Moreover, it was very difficult technically to make it the above flat thin container to some extent.
[0003] Then, as a method which was excellent in the productivity which obturates a square shape cell, obturation by the double-seaming method and the press method (method which carries out caulking obturation using some metal mold divided into each part and a bay) was considered. However, these methods had the problem that airtight obturation was difficult. moreover, laser welding -- differing -- an obturation portion -- a collar -- since it rose to the **, it became a bigger sheathing area than internal electrode area, and the problem that it was remarkable and difficult also had sheathing processing by the heat-shrinkable tubing further used for the square shape cell which obturated by the cylindrical cell or laser welding conventionally. Sheathing processing is needed in order to prevent the corrosion of a cell, to prevent short ** by contact of cells or to display the items mentioned required for each cell. There is a thing of being weak, to the stress from the outside as another trouble of a flat thin cell. One depends the thing about bending, and another on an impact from [at the time of making it fall] the side. moreover -- if it is going to obtain a flat thin cell -- many cases -- the container and lid of a flat mold -- with -- **** -- that moisture penetration of the minute amount from the heat welding section is not avoided also in this case although obturated with the heat welding film etc., and an obturation portion -- a collar -- since it rises to a **, it will become a bigger sheathing area than internal electrode area. Although invention of achieving the function of a gasket when the resin material by which coating is carried out to the material (metal plate) of a cell case and a lid carries out airtight obturation with a duplex firewood bundle method or a press method was performed in JP,6-236750,A in order to solve these problems, moisture penetration was not able to be prevented completely.
[0004]
[Problem(s) to be Solved by the Invention] this invention -- the trouble of said conventional technology -- canceling -- comparatively -- simple -- mass production -- possible -- and reinforcement -- large -- further -- high energy -- it is in offering a density flat thin square shape cell.
[0005]
[Means for Solving the Problem] a wide mouth side opens this invention wide to an one direction -- having -- and the circumference of this wide mouth side -- a collar -- with a flat thin container portion which consists of a metal simple substance which has a configuration portion In a flat thin square shape cell which carried out airtight obturation of the part for a configuration portion and a covering device by metal cementation between portions which consist of a metal simple substance and serve as a lid of this container portion -- a cell element -- containing -- moreover, a collar of said flat thin container portion -- By offering a flat thin square shape cell by which this cell is characterized by satisfying the following requirements, said technical problem was solvable.
** a collar which carried out airtight obturation -- have a portion which carried out bending of a part of configuration [at least] in the direction of a pars basilaris ossis occipitalis of a container portion.
** The length of a bending flange of the container thickness direction from a tip of a portion which carried out bending to a wide mouth side should be 1/2 or more [of container thickness of said container portion]. In addition, about an outside surface of the above-mentioned container and/or a lid, covering etc. can be processed with materials other than a metal or a metal.
[0006] Namely, although the conventional flat thin square shape cell has a trouble of being weak, to force bent physically By flat thin square shape cell of this invention, bending reinforcement and shock resistance from the cell side are improved sharply. the necessity of paying big attention also to handling of a cell -- being lost -- moreover, the former -- an obturation portion -- a collar -- it rose to a **, and it came to be able to perform sheathing processing by heat-shrinkable tubing which was difficult to process it simple, and it became possible [obtaining a flat thin square shape cell of high energy density].
[0007] In a flat thin square shape cell of this invention, when a tip of a portion and a pars basilaris ossis occipitalis of a flat thin container portion which carried out bending were located in the same plane, sheathing processing by heat-shrinkable tubing became simple. A reliable flat thin square shape cell can be obtained now by improving sharply bending reinforcement and shock resistance

from the cell side especially. Moreover, by using that by which this ****** portion was processed into length to which a tip of a portion and a pars basilaris ossis occipitalis of a flat thin container portion which carried out bending are mostly located in the same plane, before performing bending, time and effort cut to an even length after processing the length at a tip f a porti n which carried out bending could be saved, compaction of a large baton was attained, and reduction of cost was brought about. The above "the same plane" may be the thing of the range of "being the inside of the same plane mostly" that what is necessary is just to be while ["while / plane /"] doing the above effects so. When making it a tip of a portion and a pars basilaris ossis occipitalis of a flat thin container portion which carried out bending mostly located in the same plane, sheathing processing by heat-shrinkable tubing became simple.
[0008] said bending -- a collar -- by carrying out bending of the four sides of a configuration porti n to coincidence, compaction of a large baton is attained and reduction of cost can be brought about. By using press working of sheet metal at this time, a bending flang controlled more by precision can be processed now, compaction of a large baton was attained, and reduction of cost was brought about. To a wide mouth side, a range of the range of 70 degrees - 90 degrees is 80 degrees - 90 degrees desirable still more preferably, and the necessity of an angle of this flange that carried out bending of bending reinforcement and shock resistance from the cell side being sharply improved more by this invention, and paying big attention also to handling of a flat thin square shape cell was lost.
[0009] By making metal cementation of this ****** portion into ultrasonic jointing in this invention, the reliable airtight obturation section was obtained, and compaction of a large baton was attained, and reduction of cost was brought about. Furthermore, by making metal cementation of this ****** portion into laser welding in this invention, the reliable airtight obturation section was obtained, and compaction of a large baton was attained, and reduction of cost was brought about. Although this invention is hereafter explained further to details by making a case of a lithium secondary battery into an example, this invention is not limited to these. In addition, a non-aqueous solvent and an electrolyte salt fully refined, are what was made into moisture of 20 ppm or less, and used a thing of cell grade which performed deoxidation and denitrification further, and all actuation was performed under an inert gas ambient atmosphere.
[0010]
[Example] The example 1 (positive electrode) polyvinylidene-fluoride 3 weight section was dissolved in the N-methyl pyrrolidone 38 weight section, the graphite 9 weight section was added as the LiCoO250 weight section and an electric conduction agent as an active material, with the homogenizer, mixed distribution was carried out under the inert atmosphere, and the coating for positive electrodes was adjusted. After applying this to 20-micrometer aluminium foil both sides using the wire bar in atmospheric air and drying it for 30 minutes 125 degrees C, compression formation was carried out and the band-like positive electrode 1 was obtained. Both sides made sum total thickness after shaping the same as that of 70 micrometers of thickness.
(Negative electrode) The polyvinylidene fluoride 2 weight section was dissolved in the N-methyl pyrrolidone 58 weight section, the 2500-degree-C burned-product 40 weight section of corks was added, by the roll mill method, mixed distribution was carried out under the inert atmosphere, and the coating for negative electrodes was adjusted. In atmospheric air, on 20-micrometer copper foil, spreading and after drying 100 degrees C for 15 minutes, compression formation of this was carried out, and the band-like negative electrode 3 was obtained. Both sides made sum total thickness after shaping the same as that of 80 micrometers of thickness.
[0011] The volume of the separator 2 which consists of said band-like positive electrode 1, the band-like negative electrode 3, and a fine porosity polypropylene film with a thickness of 25 micrometers was carried out to the shape of an ellipse many times, and the negative electrode 3 as shown in drawing 1 , the separator 2, the positive electrode 1, and the ellipse-like swirl type electrode object 4 that carried out the laminating to the order of a separator 2 (however, not shown [this separator]) were created. Thus, the produced swirl type electrode object 4 was contained in the flat [made from aluminum] thin container 5 which performed insulating processing to the interior as shown in drawing 2 . When the size of the flat [made from aluminum] thin container 5 contains a flange by 48x90x3mm, it is 58x100x3mm (board thickness of aluminum: 0.2mm). Spot welding was carried out to the negative-electrode terminal 10 which drew the negative-electrode lead 9 made from nickel from the negative-electrode charge collector, and formed it in the cell lid 7 at the positive-electrode terminal 8 which drew the positive-electrode lead 6 made from aluminum from the positive-electrode charge collector, and formed it in the cell lid 7. The size of the cell lid 7 is 58x100mm. This flat thin container 5 was arranged in reduced pressure pouring-in equipment, it carried out reduced pressure pouring in of the electrolytic solution of 1.0 mols / lLiPF6 solution which dissolved in ethylene carbonate/dimethyl carbonate (1/1: volume ratio) into this container, and the flange 11 of four sides was obturated by argon gas arc welding in piles for the lid. Then, it left 1mm of weld zones, the four corner sections were cut off f r the square, and it bent one side of these flanges at a time in angle of 90 degrees in the direction of the lower part. After bending, the flange which has come out caudad rather than the cell pars basilaris ossis occipitalis was cut off, and the flat thin square shape cell with a size [of this invention] of 50x92x3mm was obtained by wrapping the whole cell except a terminal area in heat-shrinkable tubing. The cross section of this flat thin square shape cell container is shown in drawing 3 . The length of 13 is expressed and, as f r the length of the bending flange of this invention, container thickness expresses 12. The capacity density and the cycle property which carried out the charge and discharge of the cell produced as mentioned above at the current rate of 1/3C were evaluated. Capacity evaluation was performed by the capacity density of the cell per unit projected area from the upper part, and the unit was expressed as (mAh/cm2). Moreover, when the cycle property became 80% of initial capacity, it was evaluated. The impact resistance test dropped these ten flat thin square shape cells from a height of 100cm on the desk which consists of a marble from the side, and measured the percent defective which happens by it. Under [all / thing / that to which capacity fell rapidly after the drop test here, and / which started the malfunction by internal short-circuit / as a defect]. Measurement of a baton measured the time amount which the production process from the closure of the flange in a trial plant to bending takes.
[0012] It is the same as that of an example 1 except performing bending processing of example 2 flange to four-side coincidence.
[0013] It is the same as that of an example 1 except setting to the metal mold (dice) of bending R 0.5 which installed the container (58x100x3mm) which obturated example 3 flange by argon gas arc welding in the press machine, dropping up metal mold (punch), and processing it by bending to four-side coincidence in punch load 150kgf.
[0014] Before performing example 4 bending, it is the same as that of an example 3 except having processed into the cell lid and the flange punching processing as beforehand shown in the length to which the tip of a portion and the pars basilaris ossis occipitalis of a

flat thin container portion which carried out bending are located in a **** same plane at drawing 4 .

[0015] except for having welded the flange of 54 sides of examples by the ultrasonic welding method -- an example 4 -- the same . Ultrasonic welding welded to the flange perimeter, shifting an arm head using an arm head with a welding area of 20x3mm, so that it may have a 2mm lap. Welding performed ultrasonic welding using the 20kHz batch type welder on the amplitude of 20 micrometers, pressure 15kgf, and conditions with a weld time of 0.2 sec/shot.

[0016] It is the same as that of an example 4 except having welded the flange of 64 sides of examples by the YAG laser. The YAG laser was irradiated along with a part for the center section f the stuck flange. For 370V and 1.7ms, the conditions of welding are the pulses of 150pps and were performed with the scan speed of 20 mm/s.

[0017] It is the same as that of an example 1 except not performing example of comparison 1 bending.

[0018] It is the same as that of an example 1 except having welded the flange of 24 sides of examples of a comparison with the heat welding film (product made from polypropylene).

[0019]

[A table 1]

実 施 例	1	2	3	4	5	6
単位投影面積当たりの容量密度(mAh/cm²)	13.0	13.0	13.0	13.0	13.0	13.0
サイクル特性(回)	200<	200<	200<	200<	200<	200<
側面からの衝撃に対する不良率(%)	20	20	20	20	20	20
タクト (秒)	80	65	62	48	33	33

[0020]

[A table 2]

比 較 例	1	2
単位投影面積当たりの容量密度(mAh/cm²)	10.9	13.0
サイクル特性(回)	200<	132
側面からの衝撃に対する不良率(%)	80	50
タクト (秒)	30	90

[0021] It bends with the length of the bending flange bent at 90 degrees to the wide mouth side at drawing 5 , and relation with a load is shown. An experiment records the maximum load which took the near edge where it fixes in so that it may come to the edge of a plinth at which the amount of [of a cell longitudinal direction] center section became a right angle, and a cell is not being fixed to apply the load to down from the upper part, and to bend to the angle of 30 degrees.

[0022] It bends to drawing 6 , and bends with the angle to the wide mouth side of a flange, and relation with a load is shown. An experiment records the maximum load which took the near edge where it fixes in so that it may come to the edge of a plinth at which the amount of [of a cell longitudinal direction] center section became a right angle, and a cell is not being fixed to apply the load to down from the upper part, and to bend to the angle of 30 degrees.

[0023] The relation of the angle and percent defective to the wide mouth side of a bending flange in the impact resistance test from the side is shown in drawing 7 . The impact resistance test dropped these ten flat thin square shape cells from a height of 100cm n the desk which consists of a marble from the side, and measured the percent defective which happens by it. Under [all / thing / that to which capacity fell rapidly after the drop test here, and / which started the malfunction by internal short-circuit / as a defect].

[0024]
[Effect] 1. The necessity of bending claim 1, and reinforcement and the shock resistance from the cell side being improved sharply, and paying big attention also to the handling of a c ll was lost. moreover, the former -- an obturati n portion -- a collar -- it rose to the **, and it came to be able to perform sheathing processing by the heat-shrinkable tubing which was difficult to process it simple, and it became possible [obtaining the flat thin square shape cell of high energy density].
2. The necessity of sheathing processing by claim 2 heat-shrinkable tubing becoming simpl , and bending reinforcement and the shock resistance from the cell side being improved sharply, and paying big attention also to the handling of a cell was lost.
3. The time and effort cut to an even length after processing the length at the tip of the portion which carried out claim 3 bending could be saved, c mpacti n of a large baton was attained, and reduction of cost was brought about.
4. The necessity of bending from claim 4, and reinforcement and the shock resistance from the cell side being improved sharply, and paying big attention also to the handling of a flat thin square shape cell was lost.
5. The airtight obturation section with high claim 5 and 6 reliability was obtained, and compaction of a large baton was attained, and reduction f cost was brought about.
6. claims 7 and 8 -- compaction of a large baton was attained and reduction of cost was brought about.

[Translation done.]

* NOTICES *

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damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is drawing showing an ellipse-like swirl type electrode object.
[Drawing 2] It is drawing showing what welded the positive-electrode lead made from aluminum, and the negative-electrode lead made from nickel on a flat [made from aluminum] thin container, a flat [made from aluminum] thin container, and a cell lid.
[Drawing 3] It is drawing showing the cross section of the cell container after bending processing.
[Drawing 4] It is drawing showing punching processing of a cell lid or a cell container of four sides.
[Drawing 5] It is drawing in which bending with the length of a bending flange and showing relation with a load.
[Drawing 6] It is drawing in which bending with the angle to the wide mouth side of a bending flange, and showing relation with a load.
[Drawing 7] It is drawing showing the relation of the angle and percent defective to the wide mouth side of a bending flange in the impact resistance test from the side.
[Description of Notations]
1 Band-like Positive Electrode
2 Separator
3 Band-like Negative Electrode
4 Swirl Type Electrode Object
5 Flat [made from Aluminum] Thin Container Which Performed Insulating Processing to Interior
6 Positive-Electrode Lead made from Aluminum
7 Cell Lid
8 Positive-Electrode Terminal
9 Negative-Electrode Lead made from Nickel
10 Negative-Electrode Terminal
11 Flange
12 Container Thickness
13 The Length of Bending Flange

[Translation done.]